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A REVIEW ON BREAST CANCER DETECTION USING ARTIFICIAL NEURAL NETWORK

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ABSTRACT

The Breast Cancer disease is curable if detected in early stage. Screening is carried out on the basis of mammogram; this is used in x-ray image to reveal lumps in the breast. Calcium deposit can also indicate the existence of a tumor in breast. The breast Tumor are of two types first is Benign and second is Malignant, Benign Tumor which is non-cancerous and not life threatening and Malignant Tumor are cancerous and life threatening. Mammography is proven as efficient tool to detect breast cancer before clinical symptoms appears digital mammography is currently considered as standard procedure for breast cancer diagnosis, various artificial intelligence techniques are used for classification problems in the area of medical diagnosis. This paper presents a research on breast cases of 68 samples proven breast tumor are analyzed and classified into benign and malignant categories using ANN. Two different feature extraction methods GLCM and Intensity based features are explained here.

KEY WORDS: Artificial Neural Network (ANN), GLCM, Intensity based features, Digital Mammograms, Wavelet transform.

Introduction:
Breast cancer is the most frequent cancer in women worldwide. The disease is curable if detected early enough. Screening is carried out on the basis of mammograms, which use x-ray images to reveal lumps in the breast. Calcium deposits can also indicate the existence of a tumor. However, the deposits are often only a few tenths of a millimetre in size and so deeply embedded in dense tissue that they are nearly undetectable in the images. Mammogram samples with marked malignant tumor as shown in figure1.Digital mammography is proven as efficient tool to detect breast cancer before clinical symptoms appear [11]. Digital mammography is currently considered as standard procedure for breast cancer diagnosis, various artificial intelligence techniques are used for classification problems in the area of medical diagnosis. Feature extraction of image is important step in mammogram classification. These features are extracted using image processing techniques. Textures are one of the important features used for many applications. Texture features have been widely used in mammogram classification. The texture features are ability to distinguish between abnormal and normal cases. Texture can be characterized as the space distribution of gray levels in a neighbourhood [1, 2]. Texture feature have been proven to be useful in differentiating normal and abnormal pattern. Extracted texture features provide information about textural characteristics of the image. Different classifiers are used for medical imaging application including artificial intelligence, wavelet etc. Texture measures are two types, first order and second order.

Data Acquisition
Images of Mammogram are available in the Department of Electrical Engineering, MITS Gwalior. These images are available with the same specification (3000x4500 pixels with 16-bit pixel depth) and the total numbers of images are 68 in which 32 are healthy cases and remaining are diseased cases.

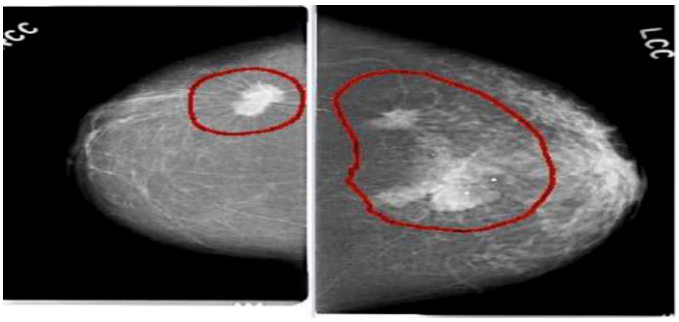

Figure: 1-Mammogram samples with marked malignant tumor

Methods and Material
The use of image processing is a physical process used to convert an image signal of the breast into a physical image. This image signal is a digital signal or analog signal, and the actual output can be either an actual physical image or the characteristics of this image. Most of the methods and techniques concerned the breast cancer diagnosis. Firstly, we find the area of interest which performs the breast in the mammogram image using step by step sequences of stages and second step to extract the features of the mammogram and classify the breast tumor stage by ANN and detect weather is malignant or benign after this work apply confusion matrix and differentiate which type of texture features gives accurate result [6].

Feature Extractions:
Texture analysis of mammograms- The texture of a mammographic image is analyzed based on the difference between high and low gray levels in it. Various texture-related parameters of mammographic images help us to determine them as normal or abnormal [7, 8, and 12]. In this work we have used two types of texture measure, first order and second order. As shown in Figure 2.
Intensity Based Features:

Intensity based features are first order statistics depends only on individual pixel values. The pixel intensities are Figure 2 Mammogram proposed method simplest available feature useful for pattern recognition. The intensity and its variation inside the mammograms can be measured by features like mean and standard deviation using 68 samples of mammograms. Experimental features are shown in Table 1.

Classification:
The algorithm uses a feed-forward back propagation network The schematic representation of neural network with 'n' inputs, 'm'hidden units and one output unit. The extracted features are considered as input to the neural classifier. A neural network is a set of connected input/output units in which each connection has a weight associated with it. The neural network trained by adjusting the weights so as to be able to predict the correct class. The desired output was specified as 0 for non-cancerous and 1 for cancerous.

Matlab is a good programming toolbox package of version 7.8, provides functional software environment for creating neural network. The main goal of this package is to provide users with a set of integrated tools neural networks to create models of biological and simulate them easily, without the need of extensive coding.

Creation network:
The function and its own parameters below are used to create and define our neural network:

Net = newfit(inputs, targets);

The argument of this function is arranged as follows:

1. The inputs of neural network where it contains two important features based (intensity based, GLCM) extracted from the image.

2. Stated target for each stage performed by one dimensional binary array just one element of this array has value '1' and other elements are assigned to '0' that's to separate the desired target from other ones.

Training and Testing Stages:
The function and its own parameters below are used to train our neural network: net = train (net, inputs, targets); the function parameters are

1. **Net:** the neural network which created previously.

2. **Inputs:** inputs of the created neural network as defined before.

3. **Targets:** stated target the neural network.

Methodology

Database of Mammogram

The Digital Database for screening Mammography (DDSM) is a resource for use by the mammographic image analysis research in the development of computer algorithms to aid in screening. Each study includes two image of each breast (age at time of study, ACR breast density rating for abnormalities, and image information (scanner, spatial resolution). Also provided is software both for accessing the mammogram and truth images and for calculating performance for automated image analysis algorithms. Texture analysis of mammograms- the texture of a mammographic analyzed based on the difference between high and low gray levels in it. Various textures related parameters of mammographic image help us to determine them as normal or abnormal.

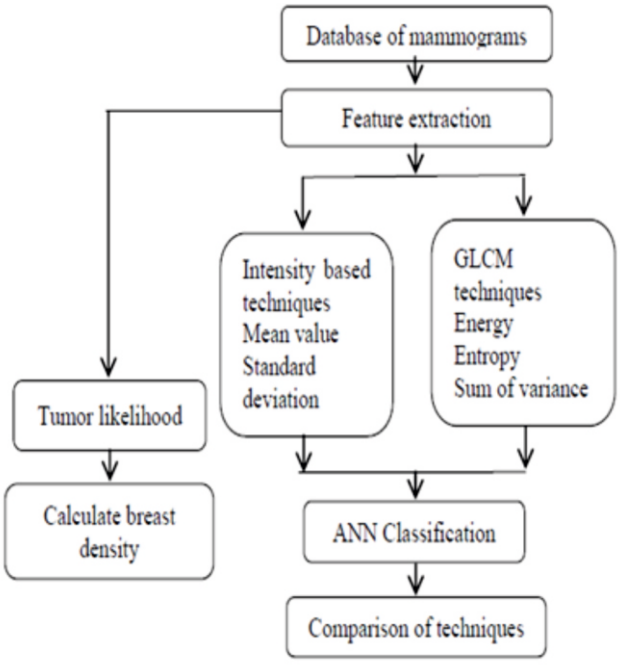

Fig. 1 Block diagram for differentiating tumor and normal cells

Literature Review

Pietro Perona, Jitendra Malik has proposed the scale-space techniques introduced by Wilkins involve generating coarser resolution image by convolving the original image with a Gaussian kernel. This approach has a major drawback: it is difficult to obtain accurately the locations of the "semantically meaningful" edges at coarse scales, and introduce a class of algorithms that realize it using a diffusion process. The algorithm involves elementary, local operations replicated over the image making parallel hardware implementations feasible.

Jialin Shen, Yuanyuan Wang, and Jianguo YU, Weiqi Wang proposed, The accurate boundary extraction is an essential preprocessing step for computerized analysis of a breast ultrasonic image Firstly, a rectangular region-ofinterest (ROI) is manually selected from the ultrasonic image, followed by the ROI-based preprocessing for the noise reduction and image enhancement. Then an initial boundary of the tumor is obtained using the wavelet transform. Experiments on 45 breasts have shown that this proposed method.

Results and Discussions:

The effectiveness of the two texture feature extraction methods are trained and testing is done using neural classifier. The dataset used for this work is composed of each method, the architecture of the neural network; training and testing samples are same. In the experiment 1, Intensity based features are extracted and its classification is done using neural classifier. In the experiment 2, GLCM features are extracted and its classification is obtained. The result shows that intensity based neural network is giving 94.11% classification rate and GLCM based neural network is giving 100% classification rate. The confusion matrix for two different feature extraction method presented in Table 3 to Table 5. The performance measures are calculated individually for the two different feature extraction methods are shown in figure 5. Figure shows the best validation performance at epoch 3 & in Figure4 (2) shows that best gradient and mutation at epoch 3.Table 3, Table4 and Table 5 shows that Intensity based confusion matrix, GLCM confusion matrix and Evaluation result. In Figure 5 there is comparison between both the features and plot their accuracy, sensitivity, specificity and Mathew's correlation coefficients.

Table: 3- Intensity Based Confusion Matrix

	Predicted	
Actual	Cancerous	Non-cancerous
Malignant	32(TP)	0(FP)
Benign	4(FN)	32(TN)

Table: 4- GLCM Confusion matrix

Actual	Predicted	
	Cancerous	Non-cancerous
Malignant	36(TP)	0(FP)
Benign	0(FN)	32(TN)

Table: 5- Evaluation Results

Feature Selection	No.of cases	S E	S P	AC (%)	MCC
Intensity Based	68	0.88	01	94.11%	0.88
GLCM	68	01	01	100%	01

CONCLUSION

We can draw the following conclusions based on the above experimental results. Breast cancer is one of the major causes of death among women. So early diagnosis through regular screening and timely treatment has been shown to prevent cancer. In this paper we have presented a novel approach to identify the presence of breast cancer mass and calcification in mammograms and extracted clinically features and after this experiments we use ANN soft computing method for detect the cancer and easily differentiate the benign and malignant. This will help doctor to take or analyze in which stage of cancer the patient have and according to which he/she can take necessary and appropriate treatment steps.

Digital mammography is currently astandard procedure for breast cancer diagnosis, various techniques are used for classification problem in the area of medical diagnosis. Feature extraction of image is important step in mammogram classification. In future aspect a real-time system can be implemented using suitable data acquisition software and hardware interface with digital mammography systems.

REFERENCES:

[1] Pradeep N, Girlish H & et.al./"Feature extraction of mammogram", International Journal of Bioinformatics research 2012, vol.4 pp-214- 244.

[2] Shekhar Singh, Dr P R Gupta/"breast cancer detection & Classification by NN"vol no.6.

[3] R.Nithya,B.Santhi/"comparative study of feature extraction, method for breast cancer classification"/Journal of theoretical and applied Information Technology, 30.11.2011, vol.33 no.2.pp 220-224.

[4] Tabar L. and Dean P.B.(2003)/"Composition &methods for detection and treatment of breast cancer".GynaecolObstet,82, pp319- 326.

[5] M.Vasantha et.al./"Medical Image feature extraction selection and classification"/International Journal of engineering science and technology vol.2 (6), 2010,pp. 2071-2076.

[6] A.MohdKhuzi, R.Besar & et.al.\"Identification of masses in digital mammogram using gray level co-occurrences matrices"/Biomedical Imaging and Intervention Journal, 2009.

[7] Kulkarni D, Bhagyashree S and Udupi G(2010) Texture Analysis of mammographic images.int.j.com.appl.5,12_17.

[8] Dubey R, Hanumandla M & Gupta S(2010) level set detected masses in digital ammograms. Indian.j.sci.Technol.3(1):9-13.

[9] Singh N and Mohapatra A (2011)Breast cancer mass detection inmammograms using K-means clustering .int.j.com.appl.22(2),15-21.

[10] Usha Rani K(2010) parallel approach for diagnosis of breast cancer using NN, int.j.com.appl.(09758887),10(3), 1-5.

[11] Ms Tripty Singh, Dr. Sarita Singh Bhadauoria, Dr A.K Wadwani and Dr S.Wadhwani, "Contrast Enhancement of Clusters In Images Using Fuzzy-Rule Based Algorithm", International Journal of Advances in Scienceand Technology, Feb Issue Vol. 2, No. 2, pp. 18-28, 2011.

[12] Ms Tripty Singh, Dr. Sarita Singh Bhadauoria, Dr. A.K Wadwani and Dr. S.Wadhwani, "Wavelet Based Contrast Enhancement and Adaptive Noise Cancellation in Mammograms", International Journal of Science and Advances Technology, Vol. 1, Issue. 9, ,pp. 256-263, Nov 2011.

[13] Ms Tripty Singh, Dr. Sarita Singh Bhadauoria, Dr. A.K Wadwani and Dr. S.Wadhwani, "Computer Aided Diagnosis System for Breast Cancer", International Journal of Scientific and Research Publications, Vol. 1, Issue. 2, , pp. 1-5 January-2012.